Name of the Applicant
SUZUKI MOTOR CORPORATION

No. of Sheets- 3
Sheet No. 1

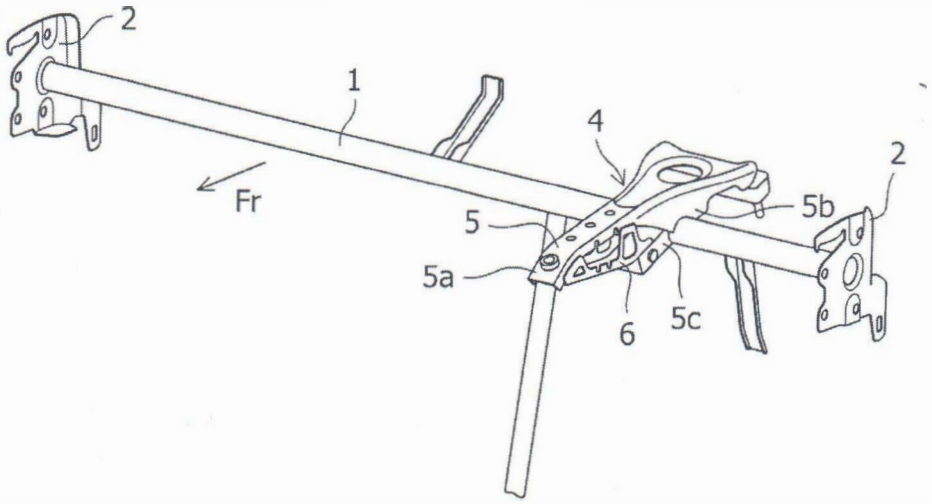

FIG. 1

April 22, 2014

Jithin Talwar
Advocate and patent Agent-
IN/PA-1117

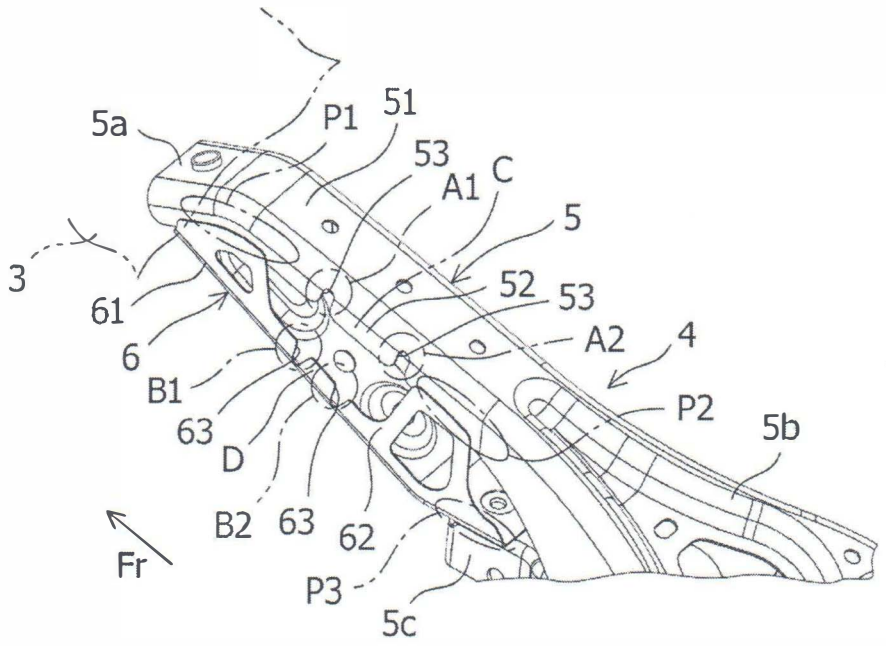

FIG. 2

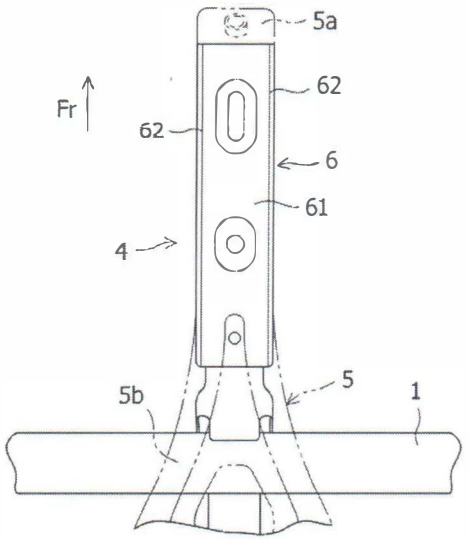

FIG. 3

April 22, 2014

Jitin Talwar
Advocate and patent Agent
IN/PA-1117

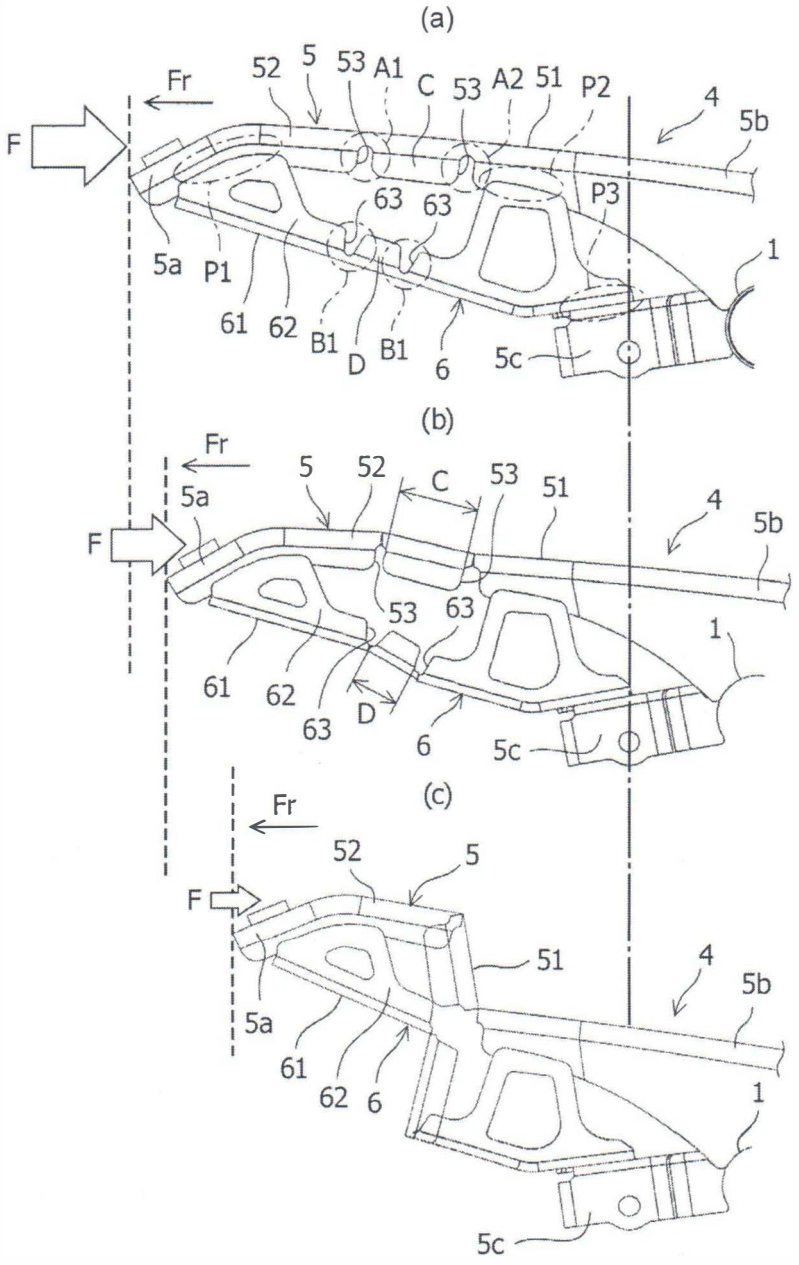

FIG. 4

April 22, 2014

Aditya Talwar
Advocate and patent Agent
IN/PA-1117

FORM 2

THE PATENTS ACT 1970

39 of 1970

&

The Patent Rules 2003

COMPLETE SPECIFICATION

(See sections 10 & rule 13)

1. TITLE OF THE INVENTION

STRUCTURE OF STEERING SUPPORT MEMBER

2. APPLICANTS (S)

NAME	NATIONALITY	ADDRESS
SUZUKI MOTOR CORPORATION	JP	300, Takatsuka-cho, Minami-ku, Hamamatsu-shi, Shizuoka-ken, JAPAN

3. PREAMBLE TO THE DESCRIPTION

COMPLETE

The following specification particularly describes the invention and the manner in which it is to be performed.

TITLE OF THE INVENTION

STRUCTURE OF STEERING SUPPORT MEMBER

Description

[Technical Field]

[0001]

The present invention relates to a structure of a steering support member that is mounted on a vehicle interior side of a vehicle, and which supports a steering shaft, an instrument panel and the like.

[Background Art]

[0002]

Conventionally, a steering support member that supports a steering shaft, an instrument panel and the like is disposed in a vehicle width direction and is mounted on a vehicle interior side of a vehicle, and both left and right ends of the steering support member in the vehicle width direction are attached to vehicle body side portions.

In such a structure of the steering support member, the steering support member is usually joined to a vehicle body at a vehicle front to secure support rigidity of the steering support member (see, for example, Patent Literatures 1 and 2). In this case, the steering support member and the vehicle body at the vehicle

front are preferably joined linearly to enhance the support rigidity of the steering support member.

[Citation List]

[Patent Literature]

[0003]

[Patent Literature 1] Japanese Patent Laid-Open No. 2010-105585

[Patent Literature 2] Japanese Patent Laid-Open No. 2000-108940

[Summary of Invention]

[Problems to be Solved by the Invention]

[0004]

However, the structure of Patent Literature 1 of the above-described conventional structures of steering support members has a problem that it is not possible to sufficiently enhance support rigidity of the steering support member since the steering support member and a vehicle body at a vehicle front are joined by a join member which has a shape having a plurality of bent portions, and these steering support member and vehicle body are not linearly joined through the join member.

Further, the structure of Patent Literature 2 has a problem in that it is not possible to sufficiently suppress vibration in a vehicle width direction since a steering support member and a vehicle body at a vehicle front are joined by stays

of which the rear end is offset in the vehicle width direction with respect to a front end, and therefore rigidity of the stays in the vehicle width direction is low. Moreover, when the stays are deformed to widen in the vehicle width direction due to collision energy from the vehicle front, the deformed stays hit peripheral parts, and therefore there is a concern that it is not possible to effectively absorb the collision energy.

[0005]

Meanwhile, when a steering support member and a vehicle body at a vehicle front are linearly joined in a vehicle longitudinal direction, there is a problem in that energy from a collision at the vehicle front is directly transmitted to the steering support member. Therefore, a structure which can enhance support rigidity of a steering support member and effectively absorb collision energy is desired.

[0006]

The present invention was made in light of such circumstances, and an object of the present invention is to provide a structure of a steering support member which can enhance support rigidity of the steering support member by forming by two parts a member which joins a vehicle body and the steering support member, and efficiently and stably absorbs energy of an external load upon collision.

[Means for Solving the Problems]

[0007]

To solve the problems of the conventional techniques, the present invention provides a structure of a steering support member which is disposed in a vehicle width direction and which is joined to a vehicle body on a vehicle front side through a join member, and the join member is formed by arranging a first reinforcement which linearly extends from the vehicle body toward a vehicle longitudinal direction and is joined to the steering support member and a second reinforcement which is fixed to the first reinforcement at vehicle front and rear positions to overlap when seen from a vehicle top view, and fragile portions which are provided to the first reinforcement and include low rigidity in a vehicle width direction are provided with an interval in the vehicle longitudinal direction and between fixing points with respect to the second reinforcement.

[0008]

Further, according to the present invention, fragile portions that are provided to the second reinforcement and include low rigidity in the vehicle width direction are provided with an interval in the vehicle longitudinal direction and between fixing points with respect to the first reinforcement.

[0009]

Furthermore, according to the present invention, the fragile portions that are provided to the first reinforcement are set at an interval in the vehicle longitudinal direction that is narrower than that of the fragile portions which are provided to the second reinforcement.

[0010]

Still further, according to the present invention, an intermediate portion of each fragile portion that is provided to the first reinforcement and the second reinforcement is provided with a rigidity retention portion of high rigidity.

[0011]

Moreover, according to the present invention, the fragile portions that are provided to the first reinforcement are arranged at a center portion between a join portion with respect to the vehicle body and a join portion with respect to the steering support member.

[0012]

In addition, according to the present invention, the first reinforcement and the second reinforcement are formed in shapes which include flange portions of flat plates that are upright on both of a left side and a right side, and the fragile portions are formed by providing cutouts in the flange portions.

[Advantageous Effects of Invention]

[0013]

As described above, a structure of a steering support member according to the present invention is a steering support member that is disposed in a vehicle width direction and that is joined to a vehicle body on a vehicle front side through a join member, and the join member is formed by arranging a first reinforcement which linearly extends from the vehicle body toward a vehicle longitudinal direction and is joined to the steering support member and a second reinforcement which is fixed to the first reinforcement at vehicle front and rear positions to overlap when seen from a vehicle top view, and fragile portions that are provided to the first reinforcement and include low rigidity in a vehicle width direction are provided with an interval in the vehicle longitudinal direction and between fixing points with respect to the second reinforcement, so that it is possible to linearly support the steering support member from the vehicle body through the first reinforcement which linearly extends, and enhance support rigidity of the steering support member.

In addition, the join member is formed by fitting together two upper and lower parts, and, consequently, when a collision load from the vehicle front is received, deformation occurs from a front end of the fragile portion of the first reinforcement as a starting point, bending deformation also occurs gradually between the fragile portions and, finally, the rear end of the fragile portion deforms and the first reinforcement is deformed in a Z shape when seen from a

vehicle side view, so that it is possible to efficiently absorb energy of a collision load and suppress an influence of collision on the steering support member.

[0014]

Further, in the structure according to the present invention, fragile portions that are provided to the second reinforcement and include low rigidity in the vehicle width direction are provided with an interval in the vehicle longitudinal direction and between fixing points with respect to the first reinforcement, so that, when a collision load is received from the vehicle front, the second reinforcement can also be deformed following the deformation of the first reinforcement and, consequently, it is possible to stably maintain load absorption performance.

[0015]

Furthermore, in the structure according to the present invention, the fragile portions that are provided to the first reinforcement are set at an interval in the vehicle longitudinal direction that is narrower than that of the fragile portions that are provided to the second reinforcement, so that, when a collision load from the vehicle front is received, it is possible to make it easier to cause secondary deformation of the first reinforcement that results in a Z shape prior to the second reinforcement, and encourage the first reinforcement to deform in a stable Z shape while preventing the second reinforcement from deforming in an unintended direction.

[0016]

Still further, in the structure according to the present invention, an intermediate portion of each fragile portion provided to the first reinforcement and the second reinforcement is provided with a rigidity retention portion of high rigidity, so that it is possible to clarify a bend point which results in deformation in a Z shape when a collision load from the vehicle front is received. In addition, it is possible to achieve enhancement of rigidity in a normal state of the join member, and to reliably cause deformation in a bending direction which results in deformation in the Z shape.

[0017]

Moreover, in the structure according to the present invention, the fragile portions which are provided to the first reinforcement are arranged at a center portion between a join portion with respect to the vehicle body and a join portion with respect to the steering support member, so that, when a collision load from the vehicle front is received, it is possible to deform the linearly set first reinforcement from a center portion and encourage transition to deformation in the Z shape.

[0018]

In addition, in the structure according to the present invention, the first reinforcement and the second reinforcement are formed in shapes that include

flange portions of flat plates that are upright on both of a left side and a right side, and the fragile portions are formed by providing cutouts in the flange portions, so that, when a collision load from the vehicle front is received, it is possible to trigger the first reinforcement to deform from the cutouts of the flange portions as a starting point prior to the second reinforcement, and help the first reinforcement deform in the Z shape.

[Brief Description of Drawings]

[0019]

[Figure 1] Figure 1 is a perspective view illustrating a steering support member of a structure according to an embodiment of the present invention and a join member seen from a vehicle front.

[Figure 2] Figure 2 is a perspective view illustrating the join member which joins the steering support member according to the embodiment of the present invention to a vehicle body at the vehicle front seen from diagonally above.

[Figure 3] Figure 3 is a plan view illustrating the join member in Figure 1 seen from the above of the vehicle.

[Figure 4] Figures 4(a) to 4(c) are side views illustrating deformation process of the join member when a collision load is received from the vehicle front.

[Mode for Carrying Out the Invention]

[0020]

The present invention will be described below in detail based on an embodiment with reference to the drawings.

Figures 1 to 4 illustrate a structure of a steering support member according to an embodiment of the present invention. Further, in Figures 1 to 4, an arrow Fr direction indicates a vehicle front.

[0021]

As illustrated in Figure 1, a steering support member 1 of a pipe shape which extends in a vehicle width direction is disposed at a front side upper portion in a vehicle interior of a vehicle, and both left and right ends of the steering support member 1 in the vehicle width direction are attached to vehicle body side portions through end portion join brackets 2. Further, the steering support member 1 is arranged inside an instrument panel (not illustrated) of a large resin molded part on which various fittings are installed, and supports the instrument panel and supports a steering shaft and a steering wheel, which are not illustrated, on a driver seat side.

[0022]

The steering support member 1 according to the present embodiment adopts a structure that is attached to a vehicle body 3 such as an upper cowl panel positioned at a vehicle front to secure rigidity for supporting the steering shaft and the like. Hence, as illustrated in Figures 2 and 3, a join member 4 that is a

separate part from the steering support member 1 is provided between the steering support member 1 and the vehicle body 3, and the steering support member 1 is joined to the vehicle body 3 through the join member 4.

[0023]

Further, as illustrated in Figures 2 and 3, the join member 4 according to the present embodiment is arranged such that an upper portion side linearly extends in a vehicle longitudinal direction to enhance support rigidity and vibration suppression performance of the steering support member 1. In addition, the join member 4 is formed using reinforcements of two upper and lower parts to provide a structure that can enhance energy absorption performance of a collision load and reliability. That is, the join member 4 according to the present embodiment is formed by arranging a first reinforcement 5 that linearly extends in the vehicle longitudinal direction from the vehicle body 3 and is joined to the steering support member 1, and a second reinforcement 6 that is welded and joined and is fixed to a side portion of the first reinforcement 5 through fixing points P1 and P2 at vehicle front and rear positions to vertically overlap when seen from a vehicle top view (top view). Hence, the second reinforcement 6 has a shorter length in the vehicle longitudinal direction than that of the first reinforcement 5 which linearly extends, and is formed in a shape which is accommodated in the first reinforcement 5.

In addition, it is optimal to provide the fixing points P1 and P2 of the second reinforcement 6 with respect to the first reinforcement 5 near a join portion of the vehicle body 3 and the first reinforcement 5 and near a join portion of the steering support member 1 and the first reinforcement 5 to achieve deformation in a Z shape when a collision load from the vehicle front is received. Further, a rear end lower portion of the second reinforcement 6 is welded and joined and is fixed to an upper portion of a support piece portion 5c which extends from a rear end portion 5b of the first reinforcement 5 toward the vehicle front, through a fixing point P3 at a center position.

[0024]

The first reinforcement 5 is linearly arranged on a top surface side of the join member 4 and along the vehicle longitudinal direction, and a front end portion 5a which is an inclined surface which is directed downward to the vehicle front is fixed to the vehicle body 3 side and the rear end portion 5b which extends along the vehicle vertical direction and which is wide is fixed to the steering support member 1. Further, as illustrated in Figures 2 and 4, in the first reinforcement 5, two fragile portions A1 and A2 which have low rigidity in the vehicle width direction are provided with an interval in the vehicle longitudinal direction and between the fixing points P1 and P2 with respect to the second reinforcement 6.

In addition, the fragile portions A1 and A2 which are provided to the first reinforcement 5 are arranged at center portions between the join portion with respect to the vehicle body 3 and the join portion with respect to the steering support member 1, and are formed such that, when a collision load from the vehicle front is received, the linearly set first reinforcement 5 is deformed from the center portion.

[0025]

Meanwhile, as illustrated in Figures 2 and 4, in the second reinforcement 6, fragile portions B1 and B2 which have low rigidity in the vehicle width direction are provided with an interval in the vehicle longitudinal direction and between the fixing points P1 and P2 with respect to the first reinforcement 5. Further, the interval between the fragile portions A1 and A2 provided to the first reinforcement 5 is set narrower than that of the fragile portions B1 and B2 provided to the second reinforcement 6. In addition, the intervals between the fragile portions A1 and A2 of the first reinforcement 5 and between the fragile portions B1 and B2 of the second reinforcement 6 in the vehicle longitudinal direction are set to different pitches.

According to this arrangement and formation of the upper and lower fragile portions A1, A2, B1 and B2, when a collision load from the vehicle front is received, the second reinforcement 6 is also deformed following deformation of

the first reinforcement 5, it makes it easier for the first reinforcement 5 to cause secondary deformation which results in a fold in a Z shape prior to the second reinforcement 6, and the first reinforcement 5 is encouraged to stably deform in the Z shape to cause the same deformation in various modes.

[0026]

Further, rigidity retention portions C and D of high rigidity are provided at intermediate portions between the respective fragile portions A1, A2, B1 and B2 provided to the first reinforcement 5 and the second reinforcement 6 to clarify a bend point which results in deformation of the Z shape when a collision load from the vehicle front is received. By installing the rigidity retention portions C and D of high rigidity, it is possible to enhance rigidity of the join member in a normal state and reliably cause deformation in a bending direction which results in deformation in the Z shape. Further, by setting a fixed relationship between the fragile portions A1, A2, B1 and B2 and the rigidity retention portions C and D of high rigidity, it is possible to cause the same deformation in the Z shape irrespectively of applied vehicle types and input loads.

[0027]

As illustrated in Figures 2 to 4, the first reinforcement 5 and the second reinforcement 6 according to the present embodiment are formed in U shapes which include main body portions 51 and 61 of flat plates and flange portions 52

and 62 which are upright on both left and right sides of the main body portions 51 and 61, and the flange portion 52 of the first reinforcement 5 extends downward and the flange portion 62 of the second reinforcement 6 extends upward.

Further, pairs of front and rear cutouts 53 and 63 which are formed by making cutouts in U shapes are provided to these flange portions 52 and 62 on both left and right sides, with intervals in the vehicle longitudinal direction, and these cutouts 53 and 63 form the fragile portions A1, A2, B1 and B2 in the first reinforcement 5 and the second reinforcement 6. Hence, when a collision load from the vehicle front is received, the first reinforcement 5 is triggered to deform from the cutouts 53 of the flange portion 52 as a starting point prior to the second reinforcement 6.

[0028]

In the vehicle that adopts the structure of the steering support member 1 that is joined to the vehicle body 3 through the join member 4 formed and arranged in this way, when a collision load from the vehicle front is received as indicated by the arrow F in Figure 4(a), deformation (buckling) is caused from the fragile portion A1 as the starting point that is the front side of the first reinforcement 5 which linearly extends from the vehicle body 3 to the steering support member 1. In the process of this deformation progress, the load is also transmitted to the second reinforcement 6, the second reinforcement 6 also

deforms by slightly deflecting, and the first reinforcement 5 moves toward the steering support member 1 at the vehicle rear as illustrated in Figure 4(b).

[0029]

Further, when deformation of the first reinforcement 5 and the second reinforcement 6 progresses, a load from a point of deformation of the fragile portion A1 which has the interval and is on the front side receives a bending load which is applied from the fragile portion A2 on the rear side as a starting point as illustrated in Figure 4(c), and then this bending load further causes bending deformation of the fragile portions A1 and A2 and also causes bending deformation of the fragile portions B1 and B2 of the second reinforcement 6. Finally, the first reinforcement 5 and the second reinforcement 6 cause deformation in the Z shape (secondary deformation) at a portion which is positioned between the fragile portions A1, A2, B1 and B2.

The first reinforcement 5 and the second reinforcement 6 deform in this way, so that energy of a collision load from the vehicle front is absorbed, transmission of the load to the steering support member 1 is suppressed and movement of the steering support member 1 toward the vehicle rear is reduced.

[0030]

In the structure of the steering support member 1 according to the embodiment of the present invention, the join member 4 which joins the steering

support member 1 to the vehicle body 3 on the vehicle front side is formed by vertically arranging the first reinforcement 5 which linearly extends from the vehicle body 3 toward the vehicle longitudinal direction and is joined to the steering support member 1, and the second reinforcement 6 which is welded and joined and is fixed to the first reinforcement 5 through the fixing points P1 and P2 at the vehicle front and rear positions to overlap when seen from the vehicle top view, and, in the first reinforcement 5, the fragile portions A1 and A2 which have low rigidity in the vehicle width direction due to the cutouts 53 provided to the flange portion 52 are provided with an interval in the vehicle longitudinal direction and between the fixing points P1 and P2 with respect to the second reinforcement 6, so that it is possible to linearly support the steering support member 1 from the vehicle body 3 through the first reinforcement 5 which linearly extends, and provide high support rigidity of the steering support member 1.

[0031]

Further, in the structure according to the present embodiment, the join member 4 is formed by fitting together two upper and lower parts which are the first and second reinforcements 5 and 6, and then when a collision load from the vehicle front is received, deformation occurs from the front end of the fragile portion A1 of the first reinforcement 5 as a starting point, bending deformation

also occurs gradually between the fragile portions A1 and A2, and, finally, the rear end of the fragile portion A2 deforms and the first reinforcement 5 deforms in the Z shape seen from the vehicle side view, so that it is possible to efficiently absorb energy of the collision load and suppress an influence of a load on the steering support member 1.

Furthermore, in the second reinforcement 6, the fragile portions B1 and B2 that have low rigidity in the vehicle width direction due to the cutouts 63 provided to the flange portion 62 are provided with an interval in the vehicle longitudinal direction and between the fixing points P1 and P2 with respect to the first reinforcement 5, so that, when a collision load from the vehicle front is received, the second reinforcement 6 can also be deformed following deformation of the first reinforcement 5, and it is possible to more stably maintain load absorption performance.

[0032]

Although an embodiment of the present invention has been described above, the present invention is not limited to the above-described embodiment, and can be variously modified and changed based on the technical idea of the present invention.

[0033]

Although, for example, the first reinforcement 5 and the second reinforcement 6 which form the join member 4 are formed in such shapes that the flange portions 52 and 62 are upright on both left and right sides of the main body portions 51 and 61 of flat plates in the above embodiment, even when the first reinforcement 5 and the second reinforcement 6 are formed using members of pipe shapes, it is possible to provide the same effect as long as conditions including features of the present invention that, for example, the second reinforcement 6 is accommodated in the first reinforcement 5 are satisfied.

[0034]

Further, although the fragile portions A1, A2, B1 and B2 of the first reinforcement 5 and the second reinforcement 6 are formed by providing the cutouts 53 and 63 to the flange portions 52 and 62 in the above-described embodiment, the fragile portions A1, A2, B1 and B2 may be formed by providing the cutouts 53 and 63 to the main body portions 51 and 61 of flat plates or providing thin portions.

Furthermore, although the first reinforcement 5 is joined to the vehicle body 3 in the above-described embodiment, as long as the join member 4 is linearly joined to the vehicle body 3 from the steering support member 1 through the first reinforcement 5, the second reinforcement 6 may be joined to the vehicle body 3.

[Reference Signs List]

[0035]

1	STEERING SUPPORT MEMBER
2	END PORTION JOIN BRACKET
3	VEHICLE BODY
4	JOIN MEMBER
5	FIRST REINFORCEMENT
5a	FRONT END PORTION
5b	REAR END PORTION
6	SECOND REINFORCEMENT
51, 61	MAIN BODY PORTION (FLAT PLATE)
52, 62	FLANGE PORTION
53, 63	CUTOUT
A1, A2	FRAGILE PORTION
B1, B2	FRAGILE PORTION
C, D	RIGIDITY RETENTION PORTION OF HIGH RIGIDITY
P1, P2	FIXING POINT

Claims:

We Claim:

[Claim 1]

A structure of a steering support member which is disposed in a vehicle width direction and which is joined to a vehicle body on a vehicle front side through a join member, characterized in that

the join member is formed by arranging a first reinforcement which linearly extends from the vehicle body toward a vehicle longitudinal direction and is joined to the steering support member, and a second reinforcement which is fixed to the first reinforcement at vehicle front and rear positions to overlap when seen from a vehicle top view, and

fragile portions which are provided to the first reinforcement and include low rigidity in a vehicle width direction are provided with an interval in the vehicle longitudinal direction and between fixing points with respect to the second reinforcement.

[Claim 2]

The structure of the steering support member according to claim 1, characterized in that fragile portions that are provided to the second reinforcement and include low rigidity in the vehicle width direction are provided with an

interval in the vehicle longitudinal direction and between fixing points with respect to the first reinforcement.

[Claim 3]

The structure of the steering support member according to claim 2, characterized in that the fragile portions that are provided to the first reinforcement are set at an interval in the vehicle longitudinal direction that is narrower than that of the fragile portions which are provided to the second reinforcement.

[Claim 4]

The structure of the steering support member according to claim 2 or 3, characterized in that an intermediate portion of each fragile portion provided to the first reinforcement and the second reinforcement is provided with a rigidity retention portion of high rigidity.

[Claim 5]

The structure of the steering support member according to any one of claims 1 to 4, characterized in that the fragile portions which are provided to the first reinforcement are arranged at a center portion between a join portion with respect to the vehicle body and a join portion with respect to the steering support member.

[Claim 6]

The structure of the steering support member according to any one of claims 1 to 5, characterized in that the first reinforcement and the second reinforcement are formed in shapes which include flange portions of flat plates which are upright on both of a left side and a right side, and the fragile portions are formed by providing cutouts in the flange portions.

April 28, 2014

Jitin Talwar
Advocate and patent Agent
IN/PA-1117

Abstract

[Problem to be Solved]

A member that joins a vehicle body and a steering support member is formed by two parts to enhance support rigidity of the steering support member, and efficiently and stably absorb energy of an external load upon collision.

[Solution]

In a structure of a steering support member 1 which is disposed in a vehicle width direction and which is joined to a vehicle body 3 on a vehicle front side through a join member 4, the join member 4 is formed by arranging a first reinforcement 5 that linearly extends from the vehicle body 3 toward a vehicle longitudinal direction and is joined to the steering support member 1 and a second reinforcement 6 which is fixed to the first reinforcement 5 at vehicle front and rear positions to overlap when seen from a vehicle top view, and fragile portions A1 and A2 that are provided to the first reinforcement 5 and include low rigidity in a vehicle width direction are provided with an interval in the vehicle longitudinal direction and between fixing points P1 and P2 with respect to the second reinforcement 6.

[Selected Drawing] Figure 2

April 22, 2014

Jitin Talwar
Advocate and patent Agent
IN/PA-1117